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PYROPHYLLITE SLATES IN NORTHERN PENNSYLVANIA.

BY ABRAHAM MEYER.

The following communication was read from Mr. Abraham Meyer as part of the Proceedings of the Mineralogical and Geological Section :

The Pyrophyllite slates of Lycoming and Tioga Counties occur in the Formation No. VIII, g. Chemung, and Formation No. IX (Red), Catskill.

The first exposure in the Chemung formation shows that these slates are found where there has been an evident disturbance of the original stratification with some infiltration of water, possibly steam, and the measures at such points seem to have undergone a great change from their usual conditions in having the coarser silica eliminated and the softer homogeneous aluminous material with a small per cent. of very finely divided silica remaining (generally) very evenly disseminated throughout the mass. This class was found near the rolls in the Chemung measures, Tioga County (where the quartzes, etc., referred to were found) it occurred in layers from one-half inch to two inches in thickness, and resembled the Vermont and Deep River, N. C., pencil slates, but did not retain its homogeneous nature for any distance. Upon the measures approaching the disturbance in the horizontal strata near the rolls, it became permeated with silica, which also formed cylindrical and ovoid masses of silicious matter, so as to cause it to undergo a complete change, unfitting it for the commercial purposes for which a perfectly homogeneous aluminous shale would be desirable.

The second exposure was observed in the middle member of Formation No. IX, Red and Gray Catskill, in Cogan House and Pine Townships, Lycoming County, and both under similar conditions but in varying quantities. In Cogan House Township the slate was observed under the concretionary ferruginous limestone (concretion of Old Red Sandstone series), in company with black shaly copper ore and a mass of light gray shales mixed with silicious and granitoid paste, the gray shales being sprinkled with a thin film and specks of green and blue carbonate of copper (no copper-ore of commercial value being observed). These slates were from one-fourth to one inch thick, and were slightly more silicious than those of the first exposure found, the whole thickness of deposit not exceed-

ing six inches, except the soft shaly measures occurring in Pine Township, which were from fifteen to eighteen inches thick. The measures, however, were very much crushed and broken up—no regular layers, but accompanied with a light sprinkle of copper green. This form of exposure was observed at three localities.

The third exposure occurs near the mouth of Otter Run, Pine Township, under a heavy mass of concretionary limestone, quite thick (and was very similar to the Vermont and Deep River, N. C., coarse pencil slates), but, being in the bed of the stream, it was difficult to ascertain the thickness and extent of deposit. Good sized plates were obtained, large enough for a medium-sized school slate, three-fourths of an inch thick.

The fourth exposure was observed near the head of a small run entering Larry's Creek, northeast of Cogan House P. O. The measures occur about fifty feet above the bed of the stream, the overlying rock being a soft, calcareous red sand rock, in places having cavities containing nodules of green sand, which, upon short exposure, disintegrate into a bluish and green sand. This bed has been observed five to eight feet thick, the washing of the overlying surface soil and rock obscuring the true thickness. The upper layers being in the bed of a run, are quite soft and shelly, but layers are quite regular at the top, being from one-fourth to one-half inch thick, while lower in the measures they are from one-half an inch to one inch in thickness. A marked peculiarity near the surface is that a number of layers have a rounded, irregular surface on the upper side and assume a great variety of concretionary forms. The observer can find regular squares faced outside of layers, but on disturbing them they fall apart into all kinds of odd and regular oval, ovoid and irregular forms, from a rough-cast for skinning stones fitted for instant use to the aborigines' hand, to others that a little labor by rubbing would soon have converted into the same form. Some of the shales have the impressions of *algæ* (?) upon them. Toward the bottom the measures change and merge into a pale, reddish and gray, micaceous, sandy shale, some of the laminae curved with rough, shallow cavities over the surface. These are followed by a shale which is somewhat cellular in appearance, but, where exposed, there is nothing in the cavities. This, in turn, is succeeded by a more highly ferruginous shale and silicious layers, gray and red in color. Among the gray measures, some are observed quite micaceous, having a bluish film over the surface, while others

are black on the line of the fossil markings; and, as this exposure is all above any heavy body of water, it forms a good point of observation for a full order of superposition, though narrowness between the banks of the run, with green timber growing thereon, is a bar to any extensive investigations as to quantity or extent of the same. The measures are all somewhat irregular on their bedding planes, but give a nearly flat surface on one plane. The entire deposit is ten to twelve feet in thickness, of which the pyrophyllite slates proper occupy about five feet of the upper portion of the measures, and is the only full section that has been seen.

The fifth exposure occurs on Bear Run, a tributary of Little Pine Creek, about two and a half miles from the mouth of the Run, on the south bank above the forks. It adjoins the edge of the Run, and is partly below water-level, a great hindrance to the full and proper study of the section, which presents itself under more inviting surroundings than any of the preceding exposures in the extent and quality of the outcrop, as well as its very interesting occurrence. It occurs at the foot of the side hill, about 1,400 feet above tide, in a cliff ten to twelve feet high, and fifteen to twenty yards in length. The overlying rocks are red and gray shales and sandstones, of Formation No. IX, Catskill group, and the roof rock is a calcareous ferruginous sandrock (with small nodules of red oxide of iron disseminated through it) in part coming in as a wedge, while another portion of the measures further west—a brownish, rotten sandrock—is the cover, immediately under which occurs a thin, shelly, fissile, red slate, six to eight inches thick. This is followed by two feet of very soft, gray, fissile slates, $\frac{1}{8}$ to $\frac{1}{2}$ -inch in thickness, increasing to $\frac{1}{4}$ -inch with much exfoliation. These may be only the result of weathering at the surface, as it was observed in going in on the measures a short distance, they became somewhat thicker and more solid. The slates on the outcrop were quite soft and aluminous (hardening on exposure). In a few of the layers were impressions of algae (?); on others, numerous rough accretions on the surface, simulating small fossil shells. Proceeding downward, the slates assumed a more distinct layerlike appearance, and became thicker, being $\frac{1}{4}$ -inch to $1\frac{1}{2}$ inches—one surface was generally quite smooth and flat, while the other would be somewhat irregular. Upon getting into these thicker layers, the removal of them opened up many odd and interesting forms resembling aboriginal stone implements. Below these the slates became thicker to water level, with

more layers containing fossil impressions of plant life. The layers now becoming more uniform in their bedding planes, with one, and sometimes both planes, smooth and parallel to each other, of a thickness of 1 to $2\frac{1}{2}$ inches, the surfaces having a slight film of a rusty, ferruginous color, sometimes bearing arborescent forms. These layers were observed 6 to 10 inches wide, and would evidently get more massive working into the side hill. The total thickness of the pyrophyllite slates is about six feet to water level. This exposure is on lands of R. J. C. Walker and Wm. Weightman of Philadelphia.